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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Arthur Marshall Stoneham

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EXAMINER

SAYADIAN, HRAYR

ART UNIT

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2814

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/506,471	Applicant(s) STONEHAM ET AL.	
	Examiner HRAYR A. SAYADIAN	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 1 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 April 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) _____ is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-28 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>8/3/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED OFFICE ACTION

Lack of Unity/Restriction Requirement

1. This application was the subject of a restriction and election requirements, mailed on 4/2/2009. The 4/29/2009 Reply elected without traverse the invention directed to a gate for quantum computing, and Species A, wherein the electron system comprises one or more electrons provided by at least one donor atom.

This Application however is a national phase of a PCT application. Accordingly, the PCT Rules apply to restriction between claimed inventions because of lack of unity. The 4/2/2009 therefore is withdrawn.

2. PCT Rule 13.1 requires that an international application relate to one invention only or to a group of inventions so linked as to form a single general inventive concept ("requirement of unity of invention"). And PCT Rule 3.2 explains that the Requirement of Unity of Invention would be fulfilled where a group of inventions is claimed in one and the same international application, the requirement of unity of invention referred to in Rule 13.1 shall be fulfilled only when there is a technical relationship among those inventions involving one or more of the same or corresponding "special technical features." And Rule 13.2 further explains that expression "special technical features" means those technical features that define a contribution which each of the claimed inventions, considered as a whole, makes over the prior art.

3. This application presents four independent claims, and a number of claims depending therefrom.

Specifically, this application presents claims in the following groups:

Group I: Claims 1-18 are directed to details of a gate of quantum information processing, classified in class 257, subclasses 9 and 29.168.

Group II: Claims 19-25 are directed to a means for applying at least one field over an array of gates for quantum computing, classified in class 250, subclass 214DC

Art Unit: 2814

Group III: Claim 26 is directed to a method for applying a field over an array of gates for quantum computing, classified in class 250, subclass 214DC.

Group IV: Claims 27 and 28 are directed to a method for fabricating "a gate," classified in class 438, subclass 798.

These groups however lack a special technical feature common to all groups. Specifically, the claims of Group I present the details of a gate for quantum computing without being limited by any means for applying a field. And claims of Groups II and III present the means and method for applying a field without being limited by the quantum computing gate. And Claims of Group IV present a method for fabricating "a gate" that fails to be limited by fabricating any feature limiting the gate to a quantum computing gate. The limitation(s) of the claims in Groups I-IV, common to all of the groups are not special technical features because they do not distinguish over the prior art as exemplified by U.S. Pat. No. 6,369,404 to "Kane."

Additionally, Group I has claims directed to several sub-groups having different technical features, wherein the common features (claim 1) lack special technical feature. Specifically:

Sub-Group I: Claim 5, wherein the interaction between the units is substantially eliminated or enhanced based on whether the electron system is in the first state or the second state respectively;

Sub-Group II: Claims 6, 7, and 12, wherein the electron system comprises electrons provided by donors;

Sub-Group III: Claims 8, 9, and 13, wherein the electron system comprises holes provided by acceptors;

Sub-Group IV: Claim 10, wherein a donor or acceptor is located between the units;

Sub-Group V: Claim 11, wherein the donor or acceptor is separated from the units by an interface.

Sub-Group VI: claim 14, wherein the energy difference between the first and second states is greater than the energy associated with information of the units;

Sub-Group VII: claim 15, wherein the energy difference is greater than 0.025 eV;

Art Unit: 2814

Sub-Group VIII: claim 16, wherein the gate is provided in a nano-crystal;

Sub-Group IX: Claim 17, wherein the units are provided in an Si channel in an SiO₂ matrix.

Claims 1-4 will be examined with the specific chosen Sub-Group.

Claim 1 fails to define a special technical feature because Kane (see, for example, the front page) discloses at least two units (ions/atoms P) and an electron system (the electrons represented by e coupling the atom/ions P), wherein the electron system is switchable (read as the ability to be switched) between states by an EM radiation (because any material can be excited by an EM field). Claims 2-4 recite technical features that are not special. For example, Kane describes units having nuclear or electronic spins, all electronic systems have ground and first excited states, and second (i.e., excited) states always have larger spatial extent than the first (i.e., ground) state.

In the interest of compact prosecution, additionally, Examiner notes that Kane appears to be distinguishable from if claim 1 recited: "A gate ... comprising: at least two units ...; an electron system having at least a first and second energy states, said first and second states being deeper than corresponding first and second energy states of said at least two units, said first and second states of the electron system providing different amounts of interaction between said units; and means for controlling the interaction between said units by switching the electron system between said first and second energy states by electromagnetic radiation."

4. Restriction for examination purposes is proper because the above-identified separate sub-group/group of claims lack unity of invention under the PCT Rules and there would be a serious search and examination burden if restriction were not required since at least one of the following applies:

- a) the inventions have acquired a separate status in the art in view of their different classification;
- b) the inventions have acquired a separate status in the art due to their recognized divergent subject matter;

Art Unit: 2814

- c) the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries);
- d) the prior art applicable to one invention would not likely be applicable to another invention; and
- e) the inventions are likely to raise different non-prior art issues under 35 U.S.C. § 101 and/or 35 U.S.C. § 112, first paragraph.

Accordingly, Applicant must elect one, and only one, of: Sub-Group I, Sub-Group II, Sub-Group III, Sub-Group IV, Sub-Group V, Sub-Group VI, Sub-Group VII, Sub-Group VIII, Sub-Group IX, Groups II and Group III, and Group IV. Please note that Groups II and III go together.

Because claims 1-4 appear to have features common to sub-Groups I-IX, they will be examined if any of Sub-Groups I-IX is elected.

A complete reply to this requirement must:

- 1. elect a one if Sub-Group I-IX and Groups II/III and IV to be examined even though the requirement may be traversed (37 CFR § 1.143); and**
- 2. list all claims reading on the elected group/sub-group, including any claims subsequently added.**

An argument that all claims are allowable, or that the requirement is in error, is nonresponsive unless accompanied by an election. See, for example, M.P.E.P § 818.03(b).

To preserve a right to petition under 37 CFR § 1.144, Applicant must elect with traverse. See, for example, M.P.E.P. § 818.03(c). An untimely traversal loses the right to petition under 37 CFR § 1.144. A traversal must be presented at the time of election to be considered timely.

If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. See, for example, M.P.E.P § 818.03(a).

Art Unit: 2814

Should Applicant traverse on the ground that the Species are not patentably distinct, Applicant should submit evidence or identify such evidence now of record showing them to be obvious variants or clearly admit on the record that this is the case. In either instance, if Examiner finds one of the Species unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. § 103(a) of the other Species.

If claims are added after the election, Applicant must indicate which of these claims are readable on the elected invention. See M.P.E.P. § 809.02(a).

Upon the cancellation of claims to a non-elected invention, Applicant must amend the inventorship complying with 37 CFR § 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Amending inventorship must be accompanied by a request under 37 CFR § 1.48(b) and include the fee required under 37 CFR § 1.17(i).

Upon the allowance of a generic claim, Applicant will be entitled to consideration of pending claims to additional Species which depend from, or otherwise require all the limitations of, an allowable generic claim as provided by 37 CFR § 1.141.

CONCLUSION

5. A shortened statutory period for reply to this Office Action is set to expire **ONE MONTH** from the mailing date of this Office Action. Applicant is reminded of the extension of time policy as set forth in 37 CFR § 1.136(a).

Any inquiry concerning this communication or earlier communications from an Examiner should be directed to Examiner Hrayr A. Sayadian, at (571) 272-7779, on Monday through Friday, 7:30 am – 4:00 pm ET.

If attempts to reach Mr. Sayadian by telephone are unsuccessful, his supervisor, Supervisory Primary Examiner Wael Fahmy, can be reached at (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2814

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available only through Private PAIR. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. The Electronic Business Center (EBC) at 866-217-9197 (toll-free) may answer questions on how to access the Private PAIR system.

/Hrayr A. Sayadian/

Patent Examiner, Art Unit 2814